

CLAIMS

1. A hybrid motor vehicle, comprising:
 - a powertrain;
 - a first driveline including a first axle driving a pair of first wheels;
 - a second driveline including a second axle driving a pair of second wheels;
 - a transfer case including an input shaft driven by said powertrain, a mainshaft, a first output shaft connected to said first driveline, a second output shaft connected to said second driveline, a mechanism coupling said mainshaft to said first output shaft, a first clutch for selectively coupling said input shaft to said mainshaft, a second clutch for selectively coupling said first output shaft to said second output shaft, and an electric motor for selectively driving said mainshaft; and
 - a control system for controlling actuation of said first and second clutches and said electric motor.
2. The hybrid motor vehicle of Claim 1 wherein said mainshaft surrounds said input shaft and said electric motor is concentrically disposed relative to said mainshaft.
3. The hybrid motor vehicle of Claim 2 wherein said electric motor is located between said first clutch and said coupling mechanism.

4. The hybrid motor vehicle of Claim wherein a hybrid two-wheel drive mode is established when said first clutch couples said input shaft to said mainshaft, said second clutch is released to uncouple said first output shaft from said second output shaft, and said electric motor is activated such that said mainshaft is driven by said electric motor and said powertrain.

5. The hybrid motor vehicle of Claim 1 wherein a hybrid four-wheel drive mode is established when said first clutch couples said input shaft to said mainshaft, said second clutch couples said first output shaft to said second output shaft, and said electric motor is activated such that said mainshaft is driven by said electric motor and said powertrain.

6. The hybrid motor vehicle of Claim 1 wherein an electric two-wheel drive mode is established when said first clutch uncouples said mainshaft from said input shaft, said second clutch uncouples said second output shaft from said first output shaft, and said electric motor is driving said mainshaft.

7. The hybrid motor vehicle of Claim 1 wherein an electric four-wheel drive mode is established when said first clutch uncouples said mainshaft from said input shaft, said second clutch couples said first output shaft to said second output shaft, and said electric motor is driving said mainshaft.

8. The hybrid motor vehicle of Claim 1 wherein an engine two-wheel drive mode is established when said first clutch uncouples said mainshaft from said input shaft, said second clutch uncouples said second output shaft from said first output shaft, and said electric motor is in a non-driving state such that said powertrain drives said mainshaft.

9. The hybrid motor vehicle of Claim 1 wherein an engine four-wheel drive mode is established when said first clutch uncouples said mainshaft from said input shaft, said second clutch couples said second output shaft to said first output shaft, and said motor is in a non-driving state such that said powertrain drives said mainshaft.

10. The hybrid motor vehicle of Claim 1 wherein said coupling mechanism includes a reduction unit having a first component driven by said mainshaft and a second component driving said first output shaft, and a third clutch normally operable in an engaged mode to couple said second component to said input shaft.

11. The hybrid motor vehicle of Claim 10 wherein said control system is operable for selectively shifting said third clutch into a released mode for uncoupling said second component from said input shaft.

12. The hybrid motor vehicle of Claim 11 wherein said coupling mechanism further includes a fourth clutch that is normally operable in a released mode and which can be selectively shifted into an engaged mode for braking rotation of a third component of said reduction unit.

13. The hybrid motor vehicle of Claim 12 wherein a high-range drive connection is established between said mainshaft and said first output shaft when said third clutch is in its engaged mode and said fourth clutch is in its released mode.

14. The hybrid motor vehicle of Claim 13 wherein a low-range connection is established between said mainshaft and said first output shaft when said control system shifts said third clutch into its released mode and said fourth clutch into its engaged mode.

15. A transfer case for a hybrid motor vehicle having a powertrain and first and second drivelines, comprising:

an input shaft driven by the powertrain;

a mainshaft;

a first output shaft adapted for connection to the first driveline;

a second output shaft adapted for connection to the second driveline;

a coupling mechanism operable for coupling said mainshaft to said first output shaft;

a first clutch for selectively coupling said input shaft to said mainshaft;

a second clutch for selectively coupling said first output shaft to said second output shaft;

an electric motor for selectively driving said mainshaft; and

a control system for controlling actuation of said first and second clutches and said electric motor.

16. The transfer case of Claim 15 wherein said mainshaft surrounds said input shaft and said electric motor is concentrically disposed relative to said mainshaft.

17. The transfer case of Claim 16 wherein said electric motor is located between said first clutch and said coupling mechanism.

18. The transfer case of Claim 15 wherein a hybrid two-wheel drive mode is established when said first clutch couples said input shaft to said mainshaft, said second clutch is released to uncouple said first output shaft from said second output shaft, and said electric motor is activated such that said mainshaft is driven by said electric motor and the powertrain.

19. The transfer case of Claim 15 wherein a hybrid four-wheel drive mode is established when said first clutch couples said input shaft to said mainshaft, said second clutch couples said first output shaft to said second output shaft, and said electric motor is activated such that said mainshaft is driven by said electric motor and the powertrain.

20. The transfer case of Claim 15 wherein an electric two-wheel drive mode is established when said first clutch uncouples said mainshaft from said input shaft, said second clutch uncouples said second output shaft from said first output shaft, and said electric motor is driving said mainshaft.

21. The transfer case of Claim 15 wherein an electric four-wheel drive mode is established when said first clutch uncouples said mainshaft from said input shaft, said second clutch couples said first output shaft to said second output shaft, and said electric motor is driving said mainshaft.

22. The transfer case of Claim 15 wherein an engine two-wheel drive mode is established when said first clutch uncouples said mainshaft from said input shaft, said second clutch uncouples said second output shaft from said first output shaft, and said electric motor is in a non-driving state such that the powertrain drives said mainshaft.

23. The transfer case of Claim 15 wherein an engine four-wheel drive mode is established when said first clutch uncouples said mainshaft from said input shaft, said second clutch couples said second output shaft to said first output shaft, and said motor is in a non-driving state such that the powertrain drives said mainshaft.

24. The transfer case of Claim 15 wherein said coupling mechanism includes a reduction unit having a first component driven by said mainshaft and a second component driving said first output shaft, and a third clutch normally operable in an engaged mode to couple said second component to said input shaft.

25. The transfer case of Claim 24 wherein said control system is operable for selectively shifting said third clutch into a released mode for uncoupling said second component from said input shaft.

26. The transfer case of Claim 25 wherein said coupling mechanism further includes a fourth clutch that is normally operable in a released mode and which can be selectively shifted into an engaged mode for braking rotation of a third component of said reduction unit.

27. The transfer case of Claim 26 wherein a high-range drive connection is established between said mainshaft and said first output shaft when said third clutch is in its engaged mode and said fourth clutch is in its released mode.

28. The transfer case of Claim 27 wherein a low-range connection is established between said mainshaft and said first output shaft when said control system shifts said third clutch into its released mode and said fourth clutch into its engaged mode.